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ABSTRACT

This study looked at the relationship between the programs students chose upon college entry, the programs from which they graduated, and the time taken to graduate. Individual student data on more than 204,000 freshmen entering 38 public, land grant, and Research I universities in 1988 and 1990 were collected. Descriptive statistics were used to summarize student entry characteristics such as college admission test scores and high school grade point averages. Logistic analysis was used to calculate and compare predicted and actual graduation rates based on student entry characteristics. Among findings were: graduation rates varied more by university than by program; time to completion varied by academic program; business and social sciences were the program areas which experienced the largest in-migration from other areas; students entering education programs had the lowest average Scholastic Assessment Test scores whereas engineering students had the highest; students initially undecided about their major were no less likely to graduate than other students and their graduation was not delayed; there was a correlation of about .28 between actual and predicted graduation rates; and there were significant differences among institutions between actual graduation rates and predicted graduation rates. Tables provide detailed findings for each institutions. (DB)

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GRADUATION RATES: DO STUDENTS' ACADEMIC PROGRAM CHOICES MAKE A DIFFERENCE?

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GRADUATION RATES: DO STUDENTS' ACADEMIC PROGRAM CHOICES MAKE A DIFFERENCE?

Introduction

In this paper, the results of the second phase of a multi-phase study which attempts to look at the graduation rates of first-time, full-time freshmen at public land-grant and research universities are discussed. At the Boston Forum in 1995, the authors of this paper presented the results of the first phase of the study. In fact, two papers were presented that year about the study. In one, the methodology used to collect the data was outlined. In the second (Kroc, Woodard, Howard and Hull, 1995), the results of Phase I were presented and discussed. As background for this study, the two papers presented in 1995 will be reviewed, since they form the foundation for this paper.

An important component of the study was the methodology used to create the data base. Specifically, all public land-grant and research universities were invited to participate in the study. Each institution was asked to send unit record files of their entering 1988 freshman class. Using IPEDS definitions for first-time, full-time freshmen, records were created for each student, which included high school GPA, SAT or ACT scores, gender, ethnicity, class rank, residency, four and five year graduation and persistence status. The files were built according to a format defined by the authors. These files were then sent to the authors' university using either FTP or e-mail as the method of transfer. The files from each of the participating institutions were then merged to form a file with over 160,000 records from some fifty-three institutions. A program was written that edited the files as they came into the server at the authors' institution. At no time in the building of this large data base did the authors have to clean or modify any of the data by hand, cutting down significantly data cleanup procedures usually necessary before analysis can begin. The successful transfer of large data bases and the subsequent building of a very large data base using technology found on virtually all campuses has implications for data exchanges among institutions and reporting in general.

The initial research drew on the work of Astin (1993) in which the predictability of graduation rates was examined in relation to students' entry characteristics. In the first paper, the authors replicated Astin's work, specifically for land-grant research universities. Student characteristics were regressed on graduation rates to produce a predicted graduation rate for each of the institutions in the study, which was then compared to the actual rate. In this analysis, the data base was composed of some 130,000 student records from 44 universities. Graduation and persistence rates (four and five year) were estimated, using high school GPA, SAT or ACT scores, gender, and ethnicity.

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Comparison of the results of Astin's prediction equation and the equation derived from the analysis described above revealed that whereas Astin obtained the strongest correlation with four year graduation rates (R=.34), our best results were obtained using five year rates (R=.32). The Astin equation over predicted four year graduation rates for 93% of the universities in the sample. However, prediction of four year graduation and persistence rates were essentially equivalent for both equations. These results raise questions about the use of Astin's equation in predicting graduation rates for land-grant, research universities.

A second analysis compared the efficiency of logistic regression equations and linear regression (the methodology used in the above analyses). In contrast to other reported findings (Dey and Astin, 1993), in each instance, logistic regression performed better than linear regression. Residual analysis showed a better fit, particularly at the extremes. Sixty-eight percent of the universities had a closer fit between their actual and predicted rates using a logistic regression model. This analysis indicated that, although it adds to the complexity to the analysis and the interpretation, logistic regression may be better than linear regression for predicting graduation rates.

A third analysis was conducted to examine the impact of university level variables on the ability to predict graduation rates. Some twenty-two variables were identified for inclusion in the study. Because of the number of variables and their disparate nature, factor analysis was used to simplify the data. Using an orthogonal rotation, six primary factors were identified from the twenty-two variables. Adding factor scores from this analysis to the student background variables improved the prediction of graduation rates somewhat. The overall logistic regression equation correctly predicted 70.2% of the students' graduation status, with the correlation between predicted and actual rates of graduation being .35. Fifty-eight percent of the university graduation rates were more accurately predicted using both student and institutional variables than with only student variables.

Methodology

In this part of our study, Phase II, we were interested in gathering data from Land Grant, Research I and AAU universities updated with a more recent cohort (1990) and including information about the program students chose upon entry and the program from which they graduated. CIP codes, which all universities use for federal IPEDS reporting, were gathered from each participating university. This database enabled us to update our previous findings and to extend our research by analyzing program level information. We answered a series of questions about graduation rates both at the university and program levels, as detailed in the results section below.

Two approaches were used. First, descriptive statistics were used to tabulate and summarize the data from a variety of perspectives. Understanding the data in a simple manner is both important in its own right and essential before proceeding to more sophisticated analyses. To simplify the data, ACT scores were converted to the SAT scale using ETS concordance tables (SAT scores are on the old scale, not recentered). Also, we converted high school class ranks to high school grade point averages for those universities that had only ranks by using a concordance table we developed from data in this study using a method developed by Chisholm (1993).

Second, based on student entry characteristics, we calculated and compared predicted and actual graduation rates using logistic regression. This extension of Astin's work (Astin, 1993; Dey and Astin, 1994) provided performance indicators by calculating predicted graduation rates against which actual rates were compared. The independent variables were high school grade point average, SAT score, sex, ethnicity and domicile; the dependent variable was whether the student had graduated after five years. This analysis was done both at the program and university levels. We plan to use the results of this analysis to identify universities with much higher than predicted rates in particular academic disciplines for future qualitative study.

Results

Descriptive Statistics

What were the summary statistics for the study?

Individual student data was collected on more than 204,000 freshmen entering 38 public, land grant, Research I universities in 1988 and 1990. Table 1 provides a list of the participating universities. As shown in Table 2 (sorted by graduation rate), the five year graduation rate for all of the students was 54.8% with an additional 9.9% still enrolled but not yet graduated. The mean SAT score was 1029; mean high school grade point average was 3.28; 49.4% were female; 14.9% were minority; and in-state residents made up 76.9% of the freshmen.

Did graduation rates vary by academic program and by university?

Yes, much more by university than by program. Table 3 displays program level data showing that five year graduation rates vary from 58.3% for freshmen who entered social sciences and interdisciplinary programs to 48.2% for those who entered health related professions. Table 2 shows a much larger variation among universities, from 25.7% for university #8 to 77.1% for #38. To illustrate

the variation of graduation rates within a specific set of programs, Table 4 details data in the sciences and math, showing a variation from a low of 29.2% for #8 to 85.5% for #38. It is also noteworthy that within sciences and math, women had a 61.2% five year graduation rate, while the rate for males was only 54.1%.

Did time to completion vary by academic program?

Yes. Table 3 shows that engineering students take longest--16.3% are still enrolled after five years--whereas business students finish fastest--only 7.3% remain enrolled after five years. A consequence of this is the underestimation of graduation rates for engineering students when looking out five or even six years.

What were the student migration patterns across programs?

Of the 112,000 graduates in the database, 26.0% graduated in business fields and 22.5% in the social sciences (see Table 5). These were also the programs that experienced the largest in-migration from other areas (each gained about 15% from other programs or undecided students). Engineering had the least amount of "swirling", while liberal arts and social sciences had the most. As we defined it: swirling = [(number of out-migrants) + (number of in-migrants)] / (number who graduated from the same program as they entered).

Since the study gathered six digit CIP codes for 93,447 graduates, we were also able to assess the number of students who changed majors between entry and graduation. Almost three of every four entering freshmen (72%) who initially chose a major--undecided students were excluded--changed to a different major before graduating.

Is there an interaction between program and university: do some universities do relatively better at graduating students in some disciplines?

No, the university rankings on five year graduation rate were highly correlated across programs--a university with a high graduation rate in one program was likely to have a high rate in other programs ($r > .95$ for seven out of the nine comparisons).

Did academic preparation vary among programs and universities?

Yes, students entering education programs had the lowest average SAT score at 949, whereas engineering students were highest at 1103. High school grade point averages had the same pattern. To put this into context, the average student entering education would have been at the 16th percentile in engineering and the 22nd percentile in sciences and math. Table 3 details these results.

Preparation varied considerably among universities, as well, ranging from an average SAT of 933 at university #8 to 1108 at #38 (see Table 2). The average freshman at #8 would have been at the 12th percentile at university #38. Looking at a specific area, the average entering sciences and math students at #8 would have been at only the 7th percentile at university # 38. Our data, then, indicate considerable variation in academic preparation across both programs and universities.

How did other student characteristics vary among programs?

As shown in Table 3, females were most likely to enter education (76%) and least likely to enter engineering fields (18%). Minority students were most likely to enter sciences and math (22.9%); least likely to enter education (7.2%). Underrepresented minorities, which we define as African American, Hispanic and Native American students, were most likely to enter health related professions (13.1%) and least likely to enter education (7.2%). Asian Americans were most likely to enter sciences and math. These findings are consistent with other national data.

Were undecided students at risk?

No, in fact undecided students, who were about 26% of the study population, perform slightly better than students who choose a major upon entry--they graduated at a slightly higher rate (56.9% compared with 54.8%), and their graduation did not appear to be delayed (a five year graduation and persistence rate of 66.5% compared with 64.7% for "decided" students). Also, undecided students had very similar entry characteristics, including high school preparation, to other students.

This finding is significant given the mythology about undecided students. Clearly undecided students are not poorly prepared upon entry, do not drop out at higher rates, and do not take longer to graduate.

Predicting Graduation Rates

As discussed earlier in this paper, in our previous study of graduation rates (Kroc, Woodard, Howard and Hull; 1995), Astin's (1993) model was used to account for the influence of student background characteristics on graduation rates. In this study we extended the logistic regression model used in Phase I of our research by including an additional, more recent, cohort (1990) with the original 1988 freshman cohort, and by adding program level data (six digit CIP codes) that could be used to predict students' graduation rates within individual programs or program areas.

How well could university graduation rates be predicted using entry characteristics?

Using logistic regression, we obtained about 66% concordance--students' were correctly classified as having graduated or not 66% of the time, where 50% would be chance level. This translates into a correlation of about .28 between actual and predicted graduation rates.

What does this mean? As an example, look at university #1 in Table 2. If you knew nothing about this university, your best guess about its graduation rate would be the mean of the sample, 54.8%, which was much lower than this university's actual rate of 68.2%. This is the kind of logic naive readers might use when looking at graduation rate data from the upcoming Student Right-to-Know reports or, currently, when perusing US News and World Report or the grad rate data in the NCAA Report. Using entry characteristics, however, the predicted rate for university #1 was 64.0%, closer to its actual rate--and a better representation of what its actual graduation rate should be.

The best predictor was high school grade point average, followed by SAT, sex, ethnicity and domicile, respectively. In Table 6, to illustrate some of these relationships in tabular form, we have aggregated the universities into either a high, medium or low group based on their graduation rates. Differences in SAT and high school grade point averages among these groups are most evident.

Clearly, the results shown in Table 2 show that entry variables can help us understand some of the large variations in graduation rates among universities. Examining the differences between actual and predicted rates, then, can help us sharpen our thinking and refine our questions about why university graduation rates vary.

Were there differences in the predictability of graduation rates at the program level?

No, we found little variation in either the strength of the relationship or the coefficients for the independent variables among the regressions produced for each program. The equations were essentially interchangeable. Given the degree of "swirling" among undergraduates, this is probably not a surprising finding. Table 7 displays the beta weights and the concordance values for each program.

Did individual universities excel in some programs, but not in others?

Again, generally, no. The correlation coefficients were about .95 when comparing the differences between actual and predicted graduation rates for universities across programs (see Table 8). A university with better than predicted graduation rates in one program was likely to have better rates for its

other programs. The exception in these data was health related professions, but much smaller numbers of students in this area may have been the primary reason for the lower correlation.

Are there differences in actual graduation rates among universities with similar predicted graduation rates?

One of the purposes of this study was to identify, at the program level, universities that graduated more students than might be expected from their entry characteristics. These universities would then be studied more thoroughly using qualitative, case study, methods in Phase III of our project. In particular, we would be looking for the influences of university "environmental" characteristics on graduation rates.

Table 9, sorted by predicted graduation rate, shows results for sciences and math programs. Examining pairs of universities with similar predicted rates, some interesting differences are evident. For example, universities #16 and #17 both had high predicted rates but differed by almost 16 percentage points in their actual graduation rates for science and math students. University #34 and #38 showed a similar pattern. University #15 and #27 were also interesting--#27 had a lower predicted rate, but higher actual rate than did #15.

Implications

These results suggest that there may be value in further studies of the particular conditions at individual universities that may influence graduation rates. Accounting for entry characteristics as best we could with this methodology, there appeared to be variance in graduation rates that was unexplained. Moreover, we found intriguing differences within specific programs among universities that appeared to have similar entering students.

Some of the differences and unexplained variance in graduation rates could be attributed to limitations in the methodology, specification error in particular. The variables used to account for "input" differences among universities do not perfectly measure what they purport to measure, and do not represent all of the dimensions of student difference. Socio-economic status, for example, is probably not adequately measured in this study. Nonetheless, we believe that this methodology does move us considerably closer to understanding differences in graduation rates that are caused by university culture and environment.

How do we answer the question posed in the title of this paper: "Graduation rates: Do students' program choices make a difference?" Our answer is a definitive yes--and no. We found that student characteristics varied

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considerably among programs, with nearly a standard deviation of difference between the low and high programs. But, program-level graduation rates for individual universities were almost entirely predictable from the university's overall graduation rate--universities with the highest total graduation rates also tended to have the highest rates in their individual programs. And when we accounted for entry characteristics using logistic regression, universities with better than predicted overall graduation rates also tended to have better rates for their individual programs.

Comparing one university with another, then, the variations among programs that occur at the graduate level are not evident at the undergraduate level. This is probably not surprising given the impact of lower division course work, when students are often taking a common core of courses; the fact that nearly three out of four students change majors; and the large number of students who are undecided when they matriculate. Overall admission criteria and the overall university environment appear to be more important than the selection of a program among undergraduates.

Finally, we believe that the findings of this study bear directly on this year's AIR Forum program theme, performance indicators. For public, Research I, Land Grant and AAU universities, the data in this study can provide valuable benchmark and comparative information. As we face increasing pressures to improve--and report on--undergraduate education, this information may be useful.

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Table 1

National Graduation Rate Study
Participating Universities

Arizona State U.
Auburn U.
Clemson U.
Iowa State U.
Louisiana State U.
Mississippi State U.
Montana State
N. Carolina State U.
North Dakota State U.
Oklahoma State U.
Penn State U.
Rutgers U.
South Dakota State U.
SUNY at Buffalo
Texas A&M U.
U. of Arkansas
U. of Tennessee
U. C. Irvine
U. C. Santa Barbara
U. of Arizona
U. of Colorado-Boulder
U. of Connecticut
U. of Georgia
U. of Idaho
U. of Iowa
U. of Kansas
U. of Maine
U. of Massachusetts
U. of Minnesota
U. of Missouri
U. of Montana
U. of New Hampshire
U. of New Mexico
U. of Oregon
U. of Vermont
U. of Washington
U. of Wisconsin-Madison
Virginia Tech U.

Table 2

National Graduation Rate Study - Combined Data From 1988 and 1990 Freshmen Cohorts

Program at Entry: ALL

Institution ID	Number of Entering Freshmen	Mean SAT	Mean H.S. GPA	% Female	% Minority	% In-State	5-Year Graduation Rate			5-Year Graduation & Persistence
							Actual Rate	Predicted Rate	Actual - Predicted	
8	3,521	933	3.11	52.3	37.9	80.3	25.7	45.8	-20.1	48.4
7	2,314	977	2.92	52.9	4.0	80.4	29.9	47.8	-17.9	44.2
29	1,602	936	3.04	43.8	3.7	75.1	31.8	49.3	-17.5	49.1
15	2,616	937	3.17	44.0	5.1	72.9	35.0	51.4	-16.4	52.4
27	4,719	943	3.14	47.6	10.0	82.7	35.1	50.1	-15.0	46.2
18	2,332	935	3.08	41.7	1.6	59.4	36.5	50.7	-14.2	50.2
28	6,720	943	2.90	54.0	14.1	93.4	37.8	45.7	-7.9	55.1
3	1,893	954	3.14	44.3	17.6	74.4	38.0	49.7	-11.7	52.1
32	7,091	973	3.05	48.4	14.0	47.7	38.3	49.8	-11.5	53.6
4	4,730	953	3.23	50.5	11.2	90.2	38.6	51.7	-13.1	49.9
9	5,536	1041	3.32	47.0	10.3	74.6	41.5	57.8	-16.3	59.6
31	9,121	981	3.17	50.5	18.7	61.8	44.5	51.8	-7.3	57.1
17	12,058	1092	3.56	45.6	17.9	95.4	47.5	61.8	-14.3	60.2
2	3,426	975	3.17	44.6	3.1	71.5	48.7	53.5	-4.8	56.3
12	7,044	970	3.11	48.0	7.6	86.4	48.8	50.5	-1.7	60.8
13	7,797	1008	3.22	52.7	7.3	86.1	52.6	54.2	-1.6	58.6
24	4,811	995	3.28	56.3	11.9	73.2	53.3	56.0	-2.7	60.3
14	4,849	1057	3.17	42.2	20.5	96.4	53.9	53.2	0.8	62.5
26	5,565	1018	3.12	47.2	7.1	58.0	55.4	52.5	2.9	67.5
21	6,271	1022	3.23	53.9	7.3	69.1	57.0	55.5	1.5	64.3
19	6,939	1052	3.35	38.0	14.3	84.7	58.5	57.1	1.4	71.2
30	6,746	1037	3.10	56.2	7.8	87.6	59.1	52.1	7.0	65.8
16	6,798	1056	3.50	48.2	29.0	85.3	59.8	61.2	-1.4	77.1
35	7,159	1067	3.40	46.8	16.9	56.4	60.8	59.7	1.1	67.6
37	7,492	1041	3.21	52.4	9.6	80.5	61.0	55.1	5.9	67.0
5	5,086	1046	3.32	52.9	13.0	79.0	63.6	57.3	6.3	70.5
10	6,118	1079	3.52	52.0	31.0	91.2	64.4	61.4	3.0	72.1
23	5,381	1034	3.38	44.7	9.5	66.8	65.5	57.9	7.6	74.4
22	10,619	1047	3.40	53.3	31.0	90.0	65.5	59.4	6.1	70.1
6	10,528	1088	3.20	51.5	7.7	61.8	65.9	57.0	8.9	75.4
1	4,993	1023	3.66	55.0	54.4	98.7	68.2	64.0	4.2	74.4
33	3,702	1071	3.32	52.5	6.4	42.7	71.2	59.5	11.8	74.8
34	4,108	1117	3.40	56.8	1.8	58.6	71.7	61.8	9.9	74.7
11	8,252	1102	3.39	43.3	12.4	72.9	71.9	60.2	11.7	76.1
38	6,672	1108	3.47	47.4	11.9	71.7	77.1	62.2	14.9	80.5
Total	204,609	1029	3.28	49.4	14.9	76.9	54.8	54.8	0.0	64.7

Table 3

National Graduation Rate Study - Combined Data From 1988 and 1990 Freshmen Cohorts

Summary by Program at Entry

Entry Program	Number of Entering Freshmen	Mean SAT	Mean H.S. GPA	% Female	% Minority	% Under-represented* Minority	5-Year Rates			
							% Graduated in Same Program	% Graduated in Other Program	Total Graduation Rate	Total Graduation & Persistence
Business, Management & Public Admin.	33,280	1004	3.23	49.1	13.8	10.2	38.7	17.7	56.4	63.7
Education	5,788	949	3.18	76.2	8.1	7.2	34.8	18.4	53.2	61.4
Engineering	21,699	1103	3.45	17.6	16.0	10.4	33.1	18.3	51.4	67.7
Health-Related Professions	6,487	987	3.31	69.0	16.6	13.1	20.2	28.0	48.2	59.3
Liberal Arts, Humanities & General Studies	17,522	998	3.17	59.6	11.1	8.4	12.4	37.2	49.6	59.1
Sciences and Math	13,346	1073	3.48	49.8	22.9	11.5	31.6	26.1	57.7	66.8
Social Sciences and Interdisciplinary	26,510	1031	3.35	57.9	20.4	11.2	30.6	27.7	58.3	67.9
Other Disciplines	17,900	1001	3.19	49.3	8.9	6.6	32.9	17.2	50.1	61.1
Undecided or Unknown Major	50,957	1033	3.24	49.6	14.5	10.0	--	56.9	56.9	66.5
Total	193,489	1029	3.28	49.4	14.9	9.9	30.7	24.1	54.8	64.7

** Underrepresented minorities include African American, Hispanic and Native American.*

Standard deviations: High school grade point average = 0.51; SAT = 168

Table 4

National Graduation Rate Study - Combined Data From 1988 and 1990 Freshmen Cohorts

Program at Entry: Sciences and Math

Institution ID	Number of Entering Freshmen	Mean SAT	Mean H.S. GPA	% Female	% Minority	% In-State	5-Year Graduation Rate			5-Year Graduation & Persistence
							Actual Rate	Predicted Rate	Actual - Predicted	
8	274	961	3.30	58.0	44.9	83.9	29.2	47.1	-17.9	51.5
7	71	1038	3.19	35.2	2.8	81.7	29.6	48.6	-19.1	46.5
32	263	1009	3.20	45.2	16.0	59.7	33.1	48.9	-15.9	52.5
3	226	994	3.30	56.6	18.1	75.7	35.0	49.9	-15.0	46.0
28	259	1020	3.12	52.9	14.3	92.7	35.5	47.8	-12.3	51.0
15	153	1000	3.42	46.4	6.5	75.8	35.9	55.0	-19.0	56.2
9	290	1098	3.46	37.2	12.1	74.5	40.7	57.8	-17.1	59.3
27	197	1060	3.38	48.2	15.2	83.8	42.1	53.9	-11.8	50.8
29	111	994	3.28	47.7	5.4	76.6	42.3	53.5	-11.2	58.6
2	218	1017	3.27	47.2	2.8	69.9	43.1	53.4	-10.3	50.5
31	537	1052	3.32	45.6	19.6	63.3	43.6	52.9	-9.3	58.1
17	1,008	1146	3.70	50.3	20.4	94.1	46.9	63.6	-16.7	58.2
26	120	1100	3.39	56.7	5.8	59.2	49.2	56.6	-7.4	61.7
18	122	1013	3.27	45.1	2.5	66.4	49.2	53.1	-3.9	58.2
12	116	1065	3.32	49.1	8.6	84.5	51.7	53.2	-1.5	62.9
24	242	1081	3.42	50.8	11.6	73.1	54.5	57.4	-2.9	59.1
4	9	1028	3.53	33.3	0.0	100.0	55.6	56.3	-0.8	77.8
13	334	1120	3.49	46.7	9.0	92.5	56.0	59.2	-3.3	63.5
30	313	1094	3.22	49.2	14.1	93.6	56.6	50.9	5.7	66.1
19	627	1077	3.35	43.7	9.7	79.9	59.5	54.0	5.5	69.2
10	866	1075	3.55	50.6	33.0	87.8	59.6	59.8	-0.2	70.3
37	470	1079	3.34	47.2	11.3	76.8	59.8	55.2	4.6	65.5
35	534	1105	3.49	44.2	14.6	61.8	61.6	58.9	2.7	68.2
5	559	1063	3.40	42.6	17.9	84.3	61.9	55.0	6.9	68.9
16	187	1136	3.66	42.8	20.9	79.7	62.6	64.5	-1.9	81.8
6	274	1129	3.42	47.4	9.5	81.4	63.5	58.4	5.1	78.8
1	1,544	1012	3.75	53.1	67.9	98.8	64.6	65.3	-0.7	72.5
22	1,345	1087	3.54	55.1	30.5	89.8	69.5	63.0	6.5	74.6
11	838	1095	3.41	56.2	13.7	73.0	70.0	57.2	12.8	73.3
23	343	1094	3.55	54.8	8.8	71.4	70.6	60.0	10.6	76.4
34	422	1141	3.53	59.2	1.7	47.9	70.9	60.9	9.9	74.6
33	368	1099	3.44	43.5	8.2	36.4	72.0	58.3	13.7	74.7
38	106	1157	3.58	31.1	3.8	62.3	85.8	62.2	23.7	87.7
Total	13,346	1073	3.48	49.8	22.9	80.2	57.7	57.7	0.0	66.8

Table 5

National Graduation Rate Study - Combined Data From 1988 and 1990 Freshmen Cohorts
Percent of 5-Year Graduates by Entry and Exit Program

Program at Graduation	Program at Entry									
	BPA	ED	ENG	HRP	LA&HU	S&M	SS&I	Other	Undecided	Total
Business, Management & Public Admin. (BPA)	11.5%	0.2%	1.2%	0.2%	1.7%	0.5%	2.0%	0.8%	8.0%	26.0%
Education (ED)	0.4%	1.8%	0.1%	0.1%	0.4%	0.2%	0.3%	0.3%	1.3%	4.9%
Engineering (ENG)	0.2%	0.0%	6.4%	0.0%	0.1%	0.2%	0.6%	0.1%	3.3%	10.9%
Health-Related Professions (HRP)	0.1%	0.1%	0.1%	1.2%	0.2%	0.2%	0.3%	0.1%	0.8%	2.9%
Liberal Arts, Humanities & General Studies (LA&HU)	0.9%	0.1%	0.2%	0.1%	1.9%	0.3%	1.3%	0.3%	2.7%	7.9%
Sciences and Math (S&M)	0.3%	0.1%	0.6%	0.5%	0.4%	3.8%	1.1%	0.2%	2.3%	9.3%
Social Sciences and Interdisciplinary (SS&I)	2.2%	0.3%	0.8%	0.4%	2.1%	1.2%	7.2%	0.8%	7.6%	22.5%
Other Disciplines (Other)	1.1%	0.3%	0.6%	0.2%	1.0%	0.5%	1.0%	5.3%	5.5%	15.5%
Total	16.7%	2.7%	10.0%	2.8%	7.7%	6.9%	13.8%	8.0%	31.4%	100.0%

= *Graduated in same program area as entered.*

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Table 6

National Graduation Rate Study - Combined Data From 1988 and 1990 Freshmen Cohorts

35 Institutions Grouped by High, Medium and Low 5-Year Graduation Rates

	Number of Entering Freshmen	Mean SAT	Mean H.S. GPA	% Female	% Minority	% Under-represented* Minority	% In-State	5-Year Graduation Rate	5-Year Graduation & Persistence
HIGH - 5-Year Graduation Rate 64.4 - 77.1% (Institutions = 9)	60,373	1073	3.40	50.4	18.8	9.3	74.5	68.6	74.5
MEDIUM - 5-Year Graduation Rate 47.5 - 63.6% (Institutions = 14)	92,041	1036	3.29	48.8	12.9	8.3	80.6	55.4	65.0
LOW - 5-Year Graduation Rate 25.7 - 44.5% (Institutions = 12)	52,195	964	3.11	49.1	13.8	10.8	73.2	37.7	52.9
TOTAL	204,609	1029	3.28	49.4	14.9	9.9	76.9	54.8	64.7

** Underrepresented minorities include African Amercian, Hispanic and Native Amercian.*

Table 7

National Graduation Rate Study - Combined Data From 1988 and 1990 Freshmen Cohorts
Logistic Regression on 5-Year Graduation - Standardized Estimates and Percent Concordant by Program

	Variables in Logistic Regression - Standardized Estimate									
Entry Program	**SAT**	**H.S. GPA**	**Female**	**African Am.**	**Asian Am.**	**Hispanic**	**Native Am.**	**White**	**Resident**	**Concordant**
Business, Management & Public Admin.	0.12	0.28	0.05	-0.07	-0.01	-0.05	-0.05	-0.03	0.02	67.2%
Education	0.15	0.26	0.14	-0.04	0.00	-0.09	-0.07	-0.01	0.01	68.7%
Engineering	0.12	0.26	0.06	-0.12	-0.03	-0.11	-0.08	-0.06	0.02	67.5%
Health-Related Professions	0.14	0.25	0.04	-0.05	-0.07	-0.09	-0.12	-0.05	0.03	66.6%
Liberal Arts, Humanities & General Studies	0.13	0.26	0.10	-0.05	-0.02	-0.02	-0.04	-0.01	0.03	67.3%
Sciences and Math	0.08	0.26	0.06	-0.11	-0.07	-0.11	-0.06	-0.12	0.01	66.2%
Social Sciences and Interdisciplinary	0.06	0.28	0.06	-0.07	-0.06	-0.07	-0.06	-0.06	0.03	65.4%
Other Disciplines	0.08	0.24	0.08	-0.03	-0.04	-0.08	-0.06	-0.01	-0.02	65.2%
Undecided or Unknown Major	0.12	0.23	0.08	-0.08	-0.04	-0.09	-0.06	-0.06	0.04	66.4%
Total	0.10	0.25	0.08	-0.08	-0.04	-0.08	-0.06	-0.06	0.02	66.2%

Table 8

National Graduation Rate Study - Combined Data From 1988 and 1990 Freshmen Cohorts
Difference Between Actual and Predicted 5-Year Graduation Rate (minimum N=50)

Institution ID	Business & Public Admin.	Education	Engineering	Health Related Professions	Liberal Arts & Humanities	Sciences and Math	Social Sciences & Interdiscip.	Other Disciplines	Undecided or Unknown Major	TOTAL
38	16.4%	16.7%	17.1%	--	16.2%	23.7%	10.8%	18.5%	12.1%	14.9%
33	10.9%	11.6%	14.0%	19.6%	14.4%	13.7%	12.5%	15.1%	--	11.8%
11	8.6%	21.3%	--	--	14.0%	12.8%	12.5%	12.3%	9.3%	11.7%
34	10.1%	15.7%	11.7%	24.4%	13.7%	9.9%	6.7%	9.1%	7.7%	9.9%
6	--	2.4%	5.8%	12.1%	--	5.1%	--	11.2%	7.4%	8.9%
23	9.0%	14.2%	6.7%	1.4%	15.0%	10.6%	8.9%	14.9%	--	7.6%
30	8.1%	4.8%	--	--	3.5%	5.7%	0.5%	5.1%	3.6%	7.0%
5	5.2%	--	3.3%	1.7%	5.7%	6.9%	8.5%	3.7%	7.5%	6.3%
22	3.3%	--	6.8%	8.5%	9.2%	6.5%	9.6%	7.8%	3.5%	6.1%
37	6.7%	9.6%	9.8%	18.8%	7.4%	4.6%	5.8%	8.3%	--	5.9%
1	3.8%	--	7.2%	--	7.8%	-0.7%	4.9%	7.2%	--	4.2%
10	0.2%	--	6.0%	--	8.5%	-0.2%	3.1%	2.3%	2.0%	3.0%
26	9.0%	8.5%	7.1%	--	9.3%	-7.4%	0.4%	1.7%	-0.7%	2.9%
19	1.0%	16.3%	15.0%	2.6%	11.5%	5.5%	7.7%	3.9%	-4.4%	1.4%
35	5.0%	-4.2%	1.6%	--	3.8%	2.7%	0.9%	-1.5%	-1.7%	1.1%
16	--	--	--	--	--	-1.9%	-3.2%	-5.6%	--	-1.4%
13	0.0%	-4.9%	-0.1%	1.2%	-8.3%	-3.3%	-4.5%	-1.6%	--	-1.6%
12	2.3%	--	-0.7%	-0.8%	--	-1.5%	-5.9%	-5.1%	-3.6%	-1.7%
24	0.8%	--	--	--	1.9%	-2.9%	0.2%	-8.2%	-13.2%	-2.7%
2	-5.2%	2.8%	2.4%	25.7%	-2.6%	-10.3%	-5.5%	-2.8%	-11.7%	-4.8%
31	-6.6%	-10.7%	-7.4%	-5.1%	-4.3%	-9.3%	-4.5%	-10.7%	-7.1%	-7.3%
28	-4.4%	-4.8%	-8.6%	-9.9%	-3.6%	-12.3%	-3.0%	-5.2%	--	-7.9%
32	-8.2%	-8.0%	-16.4%	-1.7%	-12.8%	-15.9%	-9.0%	-14.2%	-12.3%	-11.5%
3	-4.0%	-2.6%	-11.4%	--	--	-15.0%	-6.5%	-14.6%	-12.7%	-11.7%
4	-12.5%	-11.2%	-14.8%	--	-10.0%	--	--	-7.9%	--	-13.1%
18	-11.6%	--	-12.9%	-6.7%	-19.4%	-3.9%	-14.5%	-3.3%	--	-14.2%
17	-14.9%	-9.4%	-10.3%	-15.0%	-7.4%	-16.7%	-21.5%	-11.4%	--	-14.3%
27	-12.7%	-10.5%	-11.9%	12.1%	-12.1%	-11.8%	-15.5%	-14.5%	-23.4%	-15.0%
9	-15.6%	-14.9%	-6.7%	-12.6%	-19.1%	-17.1%	-17.2%	-16.4%	-17.4%	-16.3%
15	-15.4%	-14.0%	-15.8%	--	-14.4%	-19.0%	-8.6%	-13.5%	--	-16.4%
29	-18.9%	-21.3%	-10.0%	-3.1%	-16.1%	-11.2%	-15.4%	-15.4%	--	-17.5%
7	-13.7%	-17.1%	--	-21.9%	-15.7%	-19.1%	-16.9%	-15.2%	-21.8%	-17.9%
8	-18.9%	-15.4%	-17.1%	-14.2%	-20.8%	-17.9%	-23.8%	-15.7%	-21.7%	-20.1%
Correlation of Program to Total	0.97	0.91	0.93	0.70	0.95	0.93	0.94	0.94	0.97	

Table 9

National Graduation Rate Study - Combined Data From 1988 and 1990 Freshmen Cohorts

Program at Entry: Sciences and Math

Institution ID	Number of Entering Freshmen	Mean SAT	Mean H.S. GPA	% Female	% Minority	% In-State	5-Year Graduation Rate			5-Year Graduation & Persistence
							Actual Rate	Predicted Rate	Actual - Predicted	
8	274	961	3.30	58.0	44.9	83.9	29.2	47.1	-17.9	51.5
28	259	1020	3.12	52.9	14.3	92.7	35.5	47.8	-12.3	51.0
7	71	1038	3.19	35.2	2.8	81.7	29.6	48.6	-19.1	46.5
32	263	1009	3.20	45.2	16.0	59.7	33.1	48.9	-15.9	52.5
3	226	994	3.30	56.6	18.1	75.7	35.0	49.9	-15.0	46.0
30	313	1094	3.22	49.2	14.1	93.6	56.6	50.9	5.7	66.1
31	537	1052	3.32	45.6	19.6	63.3	43.6	52.9	-9.3	58.1
18	122	1013	3.27	45.1	2.5	66.4	49.2	53.1	-3.9	58.2
12	116	1065	3.32	49.1	8.6	84.5	51.7	53.2	-1.5	62.9
2	218	1017	3.27	47.2	2.8	69.9	43.1	53.4	-10.3	50.5
29	111	994	3.28	47.7	5.4	76.6	42.3	53.5	-11.2	58.6
27	197	1060	3.38	48.2	15.2	83.8	42.1	53.9	-11.8	50.8
19	627	1077	3.35	43.7	9.7	79.9	59.5	54.0	5.5	69.2
15	153	1000	3.42	46.4	6.5	75.8	35.9	55.0	-19.0	56.2
5	559	1063	3.40	42.6	17.9	84.3	61.9	55.0	6.9	68.9
37	470	1079	3.34	47.2	11.3	76.8	59.8	55.2	4.6	65.5
4	9	1028	3.53	33.3	0.0	100.0	55.6	56.3	-0.8	77.8
26	120	1100	3.39	56.7	5.8	59.2	49.2	56.6	-7.4	61.7
11	838	1095	3.41	56.2	13.7	73.0	70.0	57.2	12.8	73.3
24	242	1081	3.42	50.8	11.6	73.1	54.5	57.4	-2.9	59.1
9	290	1098	3.46	37.2	12.1	74.5	40.7	57.8	-17.1	59.3
33	368	1099	3.44	43.5	8.2	36.4	72.0	58.3	13.7	74.7
6	274	1129	3.42	47.4	9.5	81.4	63.5	58.4	5.1	78.8
35	534	1105	3.49	44.2	14.6	61.8	61.6	58.9	2.7	68.2
13	334	1120	3.49	46.7	9.0	92.5	56.0	59.2	-3.3	63.5
10	866	1075	3.55	50.6	33.0	87.8	59.6	59.8	-0.2	70.3
23	343	1094	3.55	54.8	8.8	71.4	70.6	60.0	10.6	76.4
34	422	1141	3.53	59.2	1.7	47.9	70.9	60.9	9.9	74.6
38	106	1157	3.58	31.1	3.8	62.3	85.8	62.2	23.7	87.7
22	1,345	1087	3.54	55.1	30.5	89.8	69.5	63.0	6.5	74.6
17	1,008	1146	3.70	50.3	20.4	94.1	46.9	63.6	-16.7	58.2
16	187	1136	3.66	42.8	20.9	79.7	62.6	64.5	-1.9	81.8
1	1,544	1012	3.75	53.1	67.9	98.8	64.6	65.3	-0.7	72.5
Total	13,346	1073	3.48	49.8	22.9	80.2	57.7	57.7	0.0	66.8

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